



BETTERBRICKS

BUILDING COMMISSIONING

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CASE STUDY

NORTHWEST MUSEUM OF ARTS AND CULTURE – PRESERVING HISTORICAL ARTIFACTS IN EASTERN WASHINGTON



Northwest Museum of Arts and Culture

The Northwest Museum of Arts and Culture (MAC) in Spokane (previously known as the Cheney Cowles Museum) is administered by the Eastern Washington State Historical Society. Needing to extensively upgrade its existing building and to add additional gallery and artifact storage areas, the historical society called for construction bids in 1999.

Other than the boiler room, an air handling unit (AHU), and associated chiller plant, the entire existing building was gutted. A new building was added to house five galleries, more than doubling the museum's space.

After the construction contract was awarded and site work had begun, the MAC in conjunction with the Washington State Department of General Administration's building commissioning program hired TESTCOMM, LLC to commission the facility.

COMMISSIONING QUICK FACTS

Building Name	Northwest Museum of Arts and Culture (MAC) (previously known as Cheney Cowles Museum)
Location	Spokane, Washington
Project	Renovation of existing building, plus new "east building" addition
Commissioning Scope	HVAC, humidity control, plumbing, electrical, and emergency power systems
Building Size	39,280 sq.ft. (existing) plus 45,550 sq.ft. addition. Total = 84,830 sq. ft
Total Construction Cost	\$16,006,460
Total Commissioning Cost	\$98,840 includes HVAC testing, adjusting, balancing (TAB)
Commissioning as % of Construction Cost	0.6%
Commissioning Cost per Square Foot	\$1.17
First-Year Cost Benefit	\$15,800
Annual Energy Savings	\$12,100 per year

PROJECT PARTNERS

**Washington State
Department of General
Administration**
Eric Benson

**Eastern Washington State
Historical Society**
George Applemann

TESTCOMM, LLC
(Commissioning Agent)
Jerry Ensminger

Bodell Construction
(General Contractor)
Troy Spears

MW Consulting Engineers
(Mechanical/Electrical
Contractor)
Jim Doyle, Steve Hill

BOORA Architects, Inc.
Don Trail

"Building relationships
with the construction
team members is crucial
to the success of the
process."

Jerry Ensminger
TESTCOMM, LLC

PROJECT SCOPE OF WORK

With both buildings containing artifact storage and display, temperature and humidity control are critical. Among the systems TESTCOMM commissioned were:

- Heating, ventilation, and air conditioning
- Humidity control
- Plumbing
- Electrical
- Emergency power

When construction schedules were delayed, the MAC chose to occupy the buildings in stages. Since areas selected for occupancy didn't necessarily correlate with complete mechanical or electrical systems, the commissioning agent had to carefully coordinate equipment start-up. As additional areas were scheduled to be occupied, some systems had to be re-tested and re-commissioned.

ISSUES IDENTIFIED

Several problems were discovered during start-up commissioning that could have impacted building operation and/or jeopardized the museum's collections. Important deficiencies found and corrected include:

- Sensors in several humidification air handling units were inoperable or improperly installed. Four units had inoperable temperature sensors, leaving them unprotected during freezing conditions. On another unit, duct pressure sensors had been installed improperly, which would have allowed the humidifier to continue operating without airflow, resulting in flooding of the ductwork and an adjacent gallery.
- Rooftop condensing units were not mounted and isolated properly, causing excess noise in the building. In the long run, this could have also damaged the units or structure.
- Faulty fire/smoke damper operation was traced to problems with wiring and mechanical installation.
- Natural gas piping to the boilers was installed incorrectly, allowing gas to flow directly out the roof vent. Additionally, improperly sized gas regulators prevented proper boiler operation during high demand.
- A higher-than-specified glycol solution (40% rather than 25%) was found in the heating hot water system. This would have reduced the system's efficiency.
- In the chiller room the refrigerant leak detector installed was not designed to detect the specific refrigerant being used.
- The boiler recirculation pump was not interlocked with the boiler. Thus, the boiler would attempt to operate without any flow, a potentially damaging condition.

ENERGY IMPLICATIONS OF COMMISSIONING

Commissioning achieved several energy efficiencies, including those from modifying operation of the air handling units. For example,

- Each of seven new artifact storage areas has a dedicated humidification air handling unit. The units had been scheduled to operate with a constant flow of outside air, even though the areas are not routinely occupied. The commissioning agent recommended, and the engineer agreed, that outside air be reduced to zero except when spaces are occupied. This reduced costs of humidification (steam boiler), outside air heating (gas-fired hot water boiler), and dehumidification (condensing units).
- Humidity and temperature sensors that provide feedback to a multi-zone air handling unit had not been fitted with back plates as recommended by the manufacturer. Sensors were reading conditions in the walls, not in the rooms, resulting in erroneous values being reported to the energy management system. This caused the HVAC systems to unnecessarily go to 100% humidification (electric steam generators) or full dehumidification (chiller operation). Installing sensor back plates improved the performance.
- The museum had installed lights next to several temperature sensors, resulting in misleading temperature readings and a call for chiller operation. These sensors were identified and the sensor values were removed from the chiller start-up table.

ADDITIONAL BENEFITS

In addition to energy cost benefits, other benefits that can be attributed to commissioning this project include:

- Protected new equipment from freezing
- Reduced noise of equipment operation
- Found and resolved safety issues
- Found and resolved problems that could have damaged equipment, the facility, or the museum's collections
- HVAC testing, adjusting, and balancing by the commissioning agent reduced duplication of effort and provided the opportunity to focus on system goals

PROJECT BENEFITS

- \$15,800 in first-year cost benefits (such as fewer contractor call-backs, reduced change orders, problems corrected at design stage, etc.)
- \$12,100 in estimated annual energy savings
- Identified and corrected defects in equipment, installation, and operation
- Problems found and resolved that could have jeopardized safety of the museum's collection
- Above-average whole-building performance



The MAC during construction

FOR INFORMATION ON WASHINGTON'S COMMISSIONING PROGRAM



Washington State Department of
General Administration

Division of Engineering & Architectural Services

206 General Administration Bldg.
P.O. Box 41012
Olympia WA 98504-1012

Roger Wigfield, P.E.

(360) 902-7198
rwigfie@ga.wa.gov

Commissioning website:

<http://www.ga.wa.gov/eas/bcx>

BetterBricks
is an initiative of the



**NORTHWEST
ENERGY
EFFICIENCY
ALLIANCE**
www.nwalliance.org

WHAT IS COMMISSIONING?

Building commissioning is a systematic and documented process of ensuring that building systems perform according to the design intent and the owner's operational needs.

Commissioning is used in both new construction and existing buildings.

Commissioning:

- Provides a better environment for occupants
- Reduces indoor air quality problems
- Reduces occupant complaints
- Reduces contractor call-backs and warranty issues
- Reduces energy consumption and operational costs

Technical Writing/Editing

Washington State University
Extension Energy Program